



US Army Corps
of Engineers
Detroit District

Great Lakes Update



1999 Annual Summary

As far as Great Lakes water levels are concerned, 1999 may well be looked upon as a real "downer". The '98-'99 winter, like that of '97-'98 was a mild one. It was not a snow-maker like those of '95-'96 or '96-'97. So far the '99-'00 "Millennium" winter is shaping up to be somewhat milder than normal. Since June 1998 the entire Great Lakes-St. Lawrence River system has experienced near drought conditions. Consequently, except for Lake Superior, lake levels continued to decline monthly in comparison with levels in 1998.

Hydrology, Temperature and Storm Activity

The Great Lakes levels remained at, or below their long-term averages as the region experienced a year of near normal precipitation. Lakes Superior and Ontario levels, while below average, tended to parallel their long-term monthly averages. The middle lakes (Michigan-Huron, St. Clair and Erie) continued the severe decline started in 1998. The *Monthly Bulletin of Lake Levels for the Great Lakes* shows level activity for 1999.

The La-Niña climate pattern that began during fall 1998 continued right on through 1999. The net result was a regional climate shift that kept much of the Great Lakes and east coast of the US in conditions that ranged from drier than average to severe drought.

The year started ominously with much of the

Great Lakes experiencing the "Blizzard of 1999", which began on January 2. This was the beginning of one of the worst two-week periods of winter weather on record (since the 1870's) for the region. The storm brought bitter cold, high winds and repeated heavy snowfalls over much of the Great Lakes basin. By mid-January many locations were on a path to recording the coldest January on record. Almost half of the season's snow total fell in just fifteen days. However, the second half of January was relatively warm across the southern Great Lakes basin, and with all the snowmelt, urban small stream flooding was widespread over the region.

While no single large-scale superstorm affected the bulk of the Great Lakes region, Hurricane Floyd spread heavy rains west of the Appalachians and across the Lake Ontario basin as it moved up the Atlantic Coast in mid-September. Other storms created high winds, heavy rainfall and severe thunderstorms on a more localized basis. Precipitation patterns of these storms tended to be sporadic. Because of this, precipitation amounts varied widely among each of the lake basins almost every month.

Precipitation over the Great Lakes basin as a whole for 1999 was about 32.92 inches, or about 2% above average based on preliminary U.S. National Weather Service and Canadian Atmospheric Environment Service records. Several months of above average precipitation across the Great Lakes watershed will be needed

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to counteract the rapid decline in water levels experienced during the past two years. Figure 1 below, compares the monthly deviation from the long-term average for precipitation in 1998 and 1999 over the entire basin.

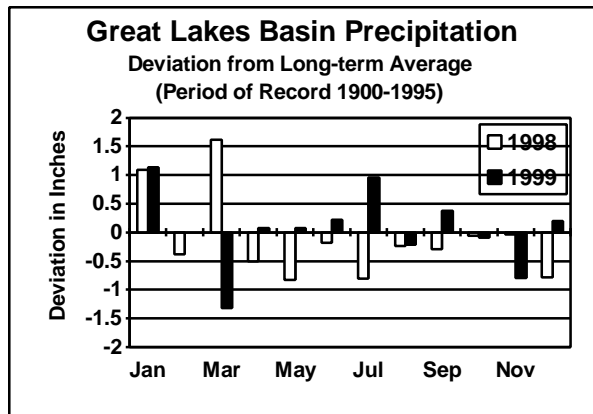


Figure 1

Warmer summer and fall temperatures combined with a mild winter resulted in minimal to non-existent ice cover formation over the lakes during the winter months. This is significant, as without the ice cover barrier, evaporation from the lakes is increased contributing to lower lake levels.

Lake Levels

The *Monthly Bulletin of Lake Levels for the Great Lakes*, which fosters this annual summary, graphically shows the water levels on the Great Lakes for 1998 and 1999. Lake Superior levels started 1999 at 600.92 feet, about 8 inches below its January long-term average (LTA). Following their normal seasonal pattern, levels started rising in March, peaking in mid-August at 602.07 feet, about 2 inches below the August LTA. From August through December levels fell, ending the year at 601.05 feet, about 9 inches below its LTA for the month just below the Low Water Datum (LWD) of 601.1 feet. Lake Superior's period of record range is from 603.38 feet to 599.48 feet, or about 3.9 feet.

Lakes Michigan-Huron levels began the year at 578.35 feet, about 3 inches below its January

LTA. These lakes peaked in mid-July at 578.77 feet, about 9 inches below the July LTA. Levels then declined through December ending the year at 577.30 feet, about 17 inches below the LTA for the month, and about 2 inches below the Low Water Datum of 577.5 feet. Lakes Michigan and Huron are considered as one lake hydraulically due to the connection at the Straits of Mackinac. They have a period of record range of 582.35 feet to 576.05 feet, or about 6.3 feet.

Lake St. Clair levels started the year at 573.82 feet, about 2 inches above its January LTA. The seasonal rise peaked at the end of June at 574.74 feet, less than an inch below the LTA. Levels fell through December ending the year at 573.13 feet, about 9 inches below its LTA for the month. Lake St. Clair has a period of record range of 577.30 feet to 570.47 feet, or about 6.8 feet.

Lake Erie levels began the year at 570.83 feet, less than an inch below its January LTA. The levels peaked at the end of April, earlier than usual, at 572.11 feet, about 6 inches above the April LTA. Levels declined through December, ending the year at 570.34, about 6 inches below its December LTA. Lake Erie has a period of record range of 574.28 feet to 568.17 feet, or about 6.1 feet.

Lake Ontario started the year at 243.64 feet, about 12 inches below its January LTA. The lake reached a peak in early July at 245.54 feet, about 6 inches below its July LTA. Levels then declined through December, ending the year at 244.36 feet, about 2 inches below its LTA for the month. Lake Ontario has a period of record range of 248.56 feet to 241.93 feet, or about 6.6 feet.

Lake Superior Regulation

During 1999, the International Lake Superior Board of Control (ILSBC) continued to use Regulation Plan 1977-A as the basis for determining Lake Superior outflows. Flow changes resulting from the monthly regulation of Lake Superior are accomplished by varying the

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amount of water allocated to hydropower production, and when necessary, by opening or closing gates in the Compensating Works at the head of the St. Marys Rapids. Water supplies were generally below average for much of the year. Consequently the levels remained below average throughout the year. Except for August and September a one-half open gate setting was maintained. In August and September the gates were set at two gates and one gate open, respectively. Outflows ranged from a high of 87,600 cubic feet per second (cfs) in August to a minimum flow of 53,700 cfs in April. The April outflow fell below the Plan 1977-A minimum of 55,000 cfs due to an unanticipated equipment failure at the Great Lakes Power Limited facilities in Sault Ste. Marie, Ontario. The low lake levels prevented the hydropower companies from using their full share of water in June, July and August. This resulted in minor under-discharge deviations from the Plan 1977-A outflows. Figure 2 compares the monthly Lake Superior outflows in 1999 with the long-term average flows (1900 - 1989 period of record). Information on the International Lake Superior Board of Control is available via the Internet at www.lre.usace.army.mil/ijc/superior.html.

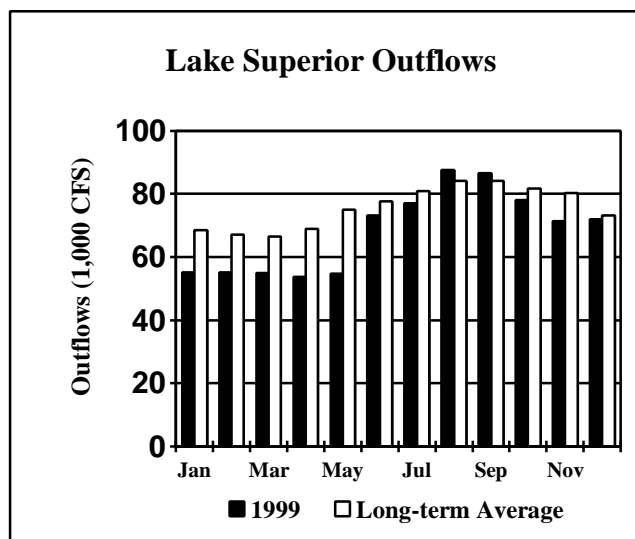


Figure 2

Lake Ontario Regulation

Although Lake Ontario began a slow rise in January, levels remained below the long-term

averages until the end of November.

Ice conditions near the International Section of the St. Lawrence River were fairly typical during January, February and March and therefore were not a concern with regards to the opening of commercial navigation. However, due to the low water levels, most residents in eastern Lake Ontario and the Thousand Islands area, for the first time, experienced very low well water levels, with some going dry. A visit was made by the Canadian Regulation Representative to the Frontenac Islands in Canada to observe first hand the severity of the problem.

The 1999 Seaway navigation season opened on March 30. The Ottawa "freshet" began during the last week of March. However, due to low precipitation, the freshet was only about half the amount it was in 1998. During April, the levels at the Port of Montreal averaged about 22.7 feet, 4.5 feet above chart datum. Due to declining Lake Ontario outflows and lower inflows from downstream tributaries including the Ottawa River, by the end of April the level at the Port of Montreal declined to 1.2 feet above chart datum. During May, June and July, the level at the Port of Montreal fell below chart datum for 11, 16 and 12 days, respectively. In August, levels at the Port of Montreal averaged about 17.5 feet, the lowest recorded monthly mean since regulation began. Similarly, in September, the levels at the Port of Montreal averaged about 17.8 feet, establishing a new record low for September since regulation began.

Generally Lake Ontario regulation followed plan requirements. Exceptions were made to prevent commercial shipping vessels from being grounded either on the St. Lawrence River, or the Port of Montreal and to assist recreation boaters on Lake St. Louis in removing their boats from the water during the weekend of October 16-17.

Due to the very low levels on Lake Ontario, there were several weeks in which outflows were based on pre-project conditions. These low

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outflows have not occurred since 1964, the only other severe low water period to occur since regulation began.

Recreational boaters upstream of the Moses-Saunders power house on the St. Lawrence River enjoyed better conditions as water levels were somewhat higher due to the lower outflows and reduced velocities and drawdowns in the river.

In October, rainfall finally slowed the seasonal decline in the Lake Ontario level. The rainfall and increased outflows resulted in the levels in the Montreal area rising considerably during the last two weeks in October. Since October 14, the daily mean levels at Montreal have remained

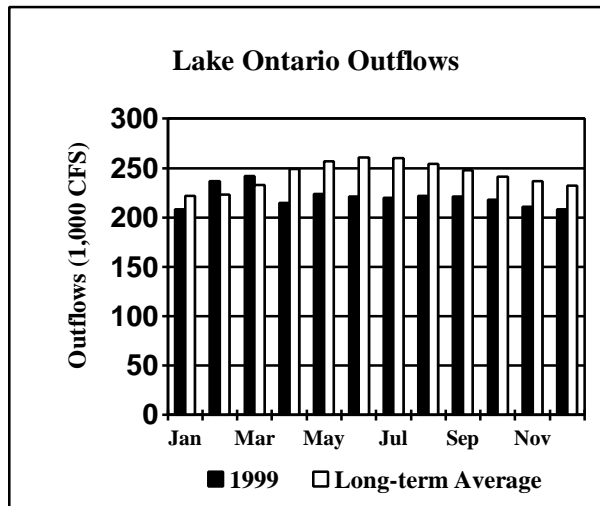


Figure 3

above chart datum. Figure 3 compares the 1999 monthly Lake Ontario outflows with the long-term-average flows (1900 - 1989 period of record).

In November, the Lake Ontario basin received above average rainfall, improving conditions downstream near Montreal considerably. At the end of December, Lake Ontario was near its long-term average and the Port of Montreal was about 1.3 feet above chart datum.

Public Concerns

During the year, the U.S. Regulation Representative office received numerous complaints of low Great Lakes water levels.

Similar complaints of low water were received by the Canadian Regulation Representative office for the areas just downstream of the Moses-Saunders powerhouse and the Montreal area. Most of these complaints were from marina operators and recreational boaters. Information on the International Niagara and St. Lawrence River Boards of Control is available via the Internet at

www.lre.usace.army.mil/ijc/niagara.html and www.islrbc.org.

Meetings with the Public

The International Lake Superior Board of Control held its annual public meeting on July 6, 1999 in Sault Ste. Marie, Ontario.

The International St. Lawrence River Board of Control held its public hearing this year at Cornwall, Ontario on June 2, 1999.

On September 14, 1999 the International Niagara Board of Control held its annual public meeting at Niagara Falls, Ontario.

In connection with the Lake Michigan Potential Damages Study, public meetings were held in Zeeland, Milwaukee (April 26-27), Manitowoc, Wisconsin (April 29), Muskegon, Michigan (November 10) and Milwaukee, Wisconsin (November 18). This study is assessing potential economic impacts on the Lake Michigan shoreline due to changing water levels. The U.S. Army Corps of Engineers, Detroit District has the lead in this study. Further information is available via the Internet at www.orcatec.com/LMPDS/.

Commercial Navigation

The Soo Locks opened the 1999 shipping season as scheduled on March 25, 1999. As of the end of November 1999, tonnage passing through the Soo Locks at Sault Ste. Marie, MI was about 5% below the comparable 1998 tonnage. United States and Canadian vessels carried about 53.6 and 14.0 million short tons of cargo respectively,

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while foreign vessels carried about 5.2 million short tons. Foreign cargo tonnage was down about 7% over comparable 1998 tonnage. Through November, a total of 3,991 cargo vessels had transited the locks, as compared to 4,113 passages the previous year. Of these, 2,291 passages were U.S.-flagged vessels, 1,109 were Canadian, and 591 were foreign vessels (ocean going or "salties"). In addition to the cargo vessels, there were also 4,495 transits by other types of vessels, such as pleasure craft, tour boats, Coast Guard, and scientific research vessels. The Corps of Engineers has the authority to keep the locks open until January 15, 1999, should shipping interests request it.

The Canadian lock at Sault Ste. Marie, Ontario reopened on May 15, 1999 for its first complete boating season since completion in July 1998 of a major reconstruction program. By season-end on October 15, 1999 4,028 vessels (pleasure craft and tour boats) carrying 95,808 passengers had transited the lock. It is expected to reopen in mid-May 2000.

According to Saint Lawrence Seaway Development Corporation's preliminary figures through mid-December 1999, tonnage passing through the Lake Ontario-Montreal section of the Seaway was down about 6% over 1998 at about 36.5 million metric tons (MMT). Vessel traffic was down about 2% over 1998 at 3,141 (combined laker and ocean vessels).

Preliminary Seaway information on a number of individual cargoes as of mid-December 1999, include: iron and steel (down 35% to about 4.0

MMT); grain (up 5% to about 13.6 MMT); coal (up 34% to about 0.27 MMT); and petroleum products (down 20% at about 1.2 MMT).

1999 Great Lakes Updates

In 1999 the following *Great Lakes Updates* were published:

"1998 Annual Summary", Vol. No. 134, Published January 4, 1999.

"Low Water Levels", Vol. No. 135, Published April 5, 1999.

"Anthropogenic Changes to Great Lakes Water Levels", Vol. No. 136, Published July 2, 1998.

"Frequently Asked Questions", Vol. No. 137, Published November 1999.

General Notes

All elevations shown in this article are referenced to the IGLD 1985 datum.

Information about Great Lakes water levels, outflows, and weather is available on the World Wide Web. The Internet address for the Detroit District's Home Page is as follows:

<http://www.lre.usace.army.mil>

Information is updated daily and monthly as required.

Places to Go -- Things to Do Next Summer

Looking for something to do while on vacation next summer? If you are near Sault Ste. Marie, Michigan, or Duluth, Minnesota think about paying a visit to the world famous "Soo Locks", or the "Twin Ports" of Duluth, Minnesota and Superior, Wisconsin. In particular stop at the visitor's centers and museums located at the U.S. Army Corps of Engineers, Detroit District Area Offices in those locations.

Canal Park and Lake Superior Maritime Visitors Center Duluth, MN

Canal Park, located on the shore of Lake Superior at the Duluth Ship Canal, focuses much of the public's interest in the port. It is an ideal vantage point for boat-watchers, as it serves nearly 300 foreign-flag vessels and an average of a thousand Great Lakes bulk freighters, "Lakers," each year. The museum draws about 425,000 visitors annually with another 3/4 million using the surrounding Canal Park

Spanning the Duluth Ship Canal is a lift bridge with a 900-ton span that rises to a height of 138 feet.



The Lake Superior Maritime Visitors Center features information on the history of Lake Superior, the shipping activity of the Twin Ports, and the work of the Corps throughout the region.



Among the attractions within the modern two-story building are full-sized replicas of ship cabins, an operating steam engine, and some of the finest scale ship models in the Midwest.

Film showings, educational programs and brochures are available to visitors, and the museum's staff help visitors make the most of their stay in Duluth-Superior, one of America's busiest ports. Visit the Twin Ports at Duluth-Superior Harbor. The Visitor's Center is open daily from April through mid-December. Groups can be accommodated year around by special appointment.

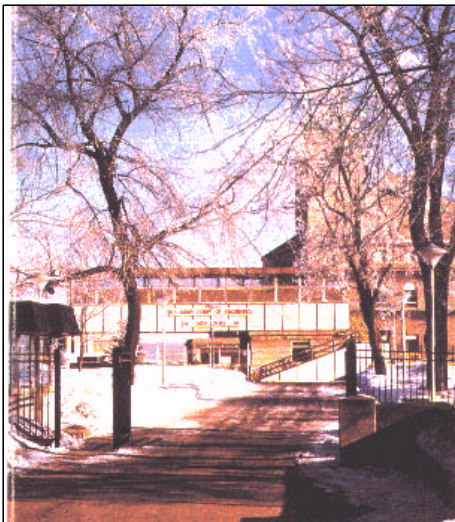


Soo Locks Visitor's Center Sault Ste. Marie, Michigan



The Corps of Engineers has taken many steps to enhance the beauty of the Soo Locks and to make the locks one of the finest tourist attractions in the United States. A significant part of this enhancement is the Visitor's Center located on the upper grounds of the St. Marys Falls Canal in Sault Ste. Marie, Michigan.

The Visitor's Center is open to the public from May to November each year. A crew of knowledgeable receptionists hosts annually about 600,000 visitors. The park area is



generally open all year.

Observation platforms are available for viewing of the vessels passing through the locks. A public address system provides general information



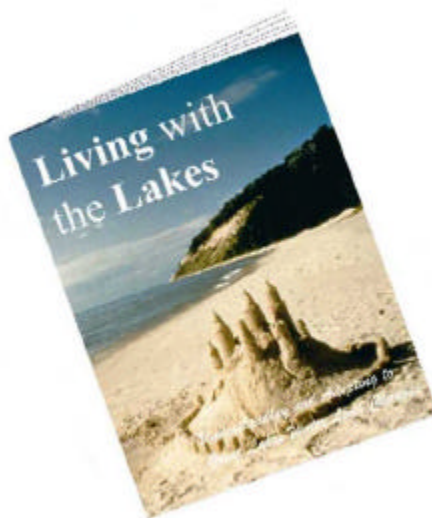
about each ship, such as size, cargo, tonnage, nationality and destination. The upper and lower grounds of the park area are beautifully landscaped. A fountain with colored lights and synchronized music is located in the park area for the visitor's enjoyment.



The Visitor's Center contains a working model of a lock, which illustrates the locking operation; a theatre featuring films and videos on the history and operation of the locks and the Great Lakes Area; a large relief map of the Great Lakes region, as well as many other artifacts, charts, maps, and photographs of interest.



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*A joint product of the U.S. Army Corps of Engineers
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